1:5000 Scale Black and White Digital Orthophoto Images
March 2000

OVERVIEW

These medium resolution images are considered the "basemap" for the Commonwealth by MassGIS and the Executive Office of Environmental Affairs (EOEA). As of March 31, 2000, the entire state is available.

There are five kinds of data associated with this project. The first is the digital black and white orthophotos themselves, available in four resolutions (half-, 1-, 2- and 5-meter). The second is 3-meter contours generated from digital terrain models (DTMs) developed as part of the production process for the orthophotos. The third and fourth are point elevation coverages and breaklines, produced during the 3-meter contour generation process. The fifth is annotation based on the USGS GEONAMES datalayer (see individual description pages for details regarding these four data layers). All of these layers are tiled with the 4000 x 4000 meter NAD83 Orthophoto Index Grid. The naming convention for these layers as exported includes the ID of the index grid sheet prefixed by an "hp" for contour, a "p" for points, an "l" for breaklines, or an "an" for annotation. The half-meter images use only the ID of the index grid sheet for a file name; the other resolutions use "1_", "2_", and "5_" followed by the index ID. The Grid ID is the first 3 digits of the xy coordinate pair for the lower right corner of each cell.

MassGIS has developed an "Orthophoto Viewer" that allows seamless viewing of all the images in the state. See http://www.state.ma.us/mgis/mapping.htm for details. The Massachusetts Institute of Technology has developed a Digital Orthophoto Browser. Through this Web interface you may view a set of Boston area digital orthophotos at several different zoom levels, with pan, zoom, and download functionality. Its Web address is http://ortho.mit.edu.

PRODUCTION

Stereoscopic aerial photography with 80% forward and 40% side overlap was collected along flight lines running approximately north/south during spring "leaves off" periods at a flying height of 15,000 ft. with a 6 inch mapping camera with forward motion compensation. The scale of the photography is therefore 1:30,000.

Ground control targets were set out prior to the flight and photo recognizable points were substituted for targets that were lost. Horizontal control (referenced to NAD83) conforms to the Federal Geodetic Control Committee specifications for Second Order Class 2 GPS surveys. Vertical control (referenced to NAVD88) is within 10 cm. It is tied to second order Class II NGRS benchmarks. In addition the latitude, longitude and ellipsoidal heights of continuously operating GPS reference stations were incorporated into the control adjustment. Orthometric heights were directly measured or estimated from GPS derived ellipsoidal heights.

Aerial Triangulation (AT) block models were developed and tested for accuracy. Adjacent blocks are tied to new ones to insure a "seamless" image. These reports are on file at MassGIS.

DTM data points were collected on analytical stereoplotters at a sufficient density y to support generation of 3 meter contours conforming to the National Map Accuracy Standards (+ or - 1.5 meters). Mass points were collected along parallel scan lines 75 meters apart at variable density as a function of the topography and other ground features. Spot elevations at summits and in depressions and breaklines along significant linear features were also collected. Distinctions between "hard" and "soft" breaklines were established and standardized to facilitate the generation of contours.

The photography was scanned at 15 microns and the images were differentially rectified using the DTMs and the AT block models. The histogram for tonal adjustment provides for a range of gray

shades from 30 to 225 (out of 256), thus allowing pure black and white to be legible when over plotted on the images. Accuracy of the image was given precedence over tonal consistency at the edges of the images. The final digital images were clipped with the Orthophoto Index Grid, thus the tiles do not overlap. The images meet or exceed the National Map Accuracy Standards to the extent that 90% of the well-defined features fall within 0.5mm of their true position on the ground at the nominal output scale of 1:5,000 (2.5m on the ground). Additionally, the maximum displacement of well-defined features is less than 5 meters. Each pixel in the original digital orthophoto image represents 0.5 meters on the ground.

Each half-meter image contains 8,000 x 8,000 pixels, which equates with a file of 64 megabytes (mb). The half-meter images are stored in .BIL format with associated .HDR files. These images have been resampled at 1- (16 mb), 2- (4 mb) and 5- (640 kb) meter resolutions and are stored in tiff format with associated .TFW world files. The resampling process was done in the ARC/INFO GRID module.

MassGIS also distributes these images in the MrSID format. MrSID (Multi-resolution Seamless Image Database) is a product of Lizardtech, Inc. that uses wavelet technology to achieve high compression levels within images with minimal loss of image quality. Each half-meter .bil and one-meter tiff has been compressed at a 10:1 compression ratio with eight zoom levels. Each half-meter SID image is named <sheet-ID>.sid; each one-meter SID image is named 1_<sheet-ID>.sid. All SID images are accompanied by an associated .sdw header file for use in ArcView 3.1 with the MrSID Image Extension. The SID images may also be viewed with the MrSID Image Viewer, available free at http://www.lizardtech.com, or in other software that supports the .sid format. Also available are ten composite images in MrSID format at 1-meter resolution. These images cover large areas of the state and ensure that every major watershed may be displayed within one complete image. Orthophotos and all other MassGIS data may be ordered online at http://www.state.ma.us/mgis/order.htm or by submitting an order form found earlier in this book.

ATTRIBUTES

There are no attributes for the images. Each pixel is coded with a gray-shade value ranging from 30-225. The resampled images each have their first two left-most pixels in the top row coded as 0 (pure black) and 255 (pure white) to avoid contrast stretch when grids were converted to images.

MAINTENANCE

The datalayer is maintained by MassGIS. See the MassGIS Web site for index and status maps pertaining to the Orthophoto project (http://www.state.ma.us/mgis/maps.htm).

USGS 1:12,000 Black and White Digital Orthophoto Images
May 1998

OVERVIEW

The U.S. Geological Survey created these orthophotos as part of its National Aerial Photography Program (NAPP). They were post-processed by MassGIS to conform to same tiling scheme and projection as the MassGIS 1:5000 black and white orthophotos. The original products are 1-meter ground resolution, quarter-quadrangle (3.75-minutes of latitude by 3.75-minutes of longitude) images cast on the Universal Transverse Mercator Projection (UTM) on the North American Datum of 1983 (NAD83). The geographic extent of the DOQ is equivalent to a quarter-quad plus an overedge ranging from 50 meters to 300 meters beyond the extremes of the primary (NAD83) and secondary (NAD27) corner points. The overedge was included to facilitate tonal matching for mosaicking and for the placement of the NAD83 and secondary datum corner tics.

PRODUCTION

USGS created raster images by scanning 1:40,000 scale aerial black and white photograph film diapositives with a precision image scanner, using an aperture of approximately 25 to 32 microns. The scanner converted the photographic image densities to gray scale values ranging from 0 to 255. Scan files with ground resolution less than 1 meter or greater than 1 meter but less than 1.28 meters were resampled to 1 meter. All DOQs are cloud free within the 3.75' image area. Source photography was leaf-off in deciduous vegetation regions.

Ground control points in UTM NAD83 were acquired from ground surveys or developed in aerial triangulation models and are third order class 1 or better, and meet National Map Accuracy Standards (NMAS) for 1:12,000-scale. Horizontal and vertical residuals of aerotriangulated tie-points are equal to or less than 2.5 meters. Rectification was accomplished using Digital Elevation Models (DEMs) covering the same area as the scanned image, ground control points, orientation parameters, and a camera calibration report. All data was inspected according to a quality control plan and tested for attribute accuracy, logical consistency, data completeness and horizontal positional accuracy.

MassGIS took the USGS images and mosaicked and projected them to the Massachusetts State Plane Coordinate System, NAD83 Mainland Zone using the ARC/INFO GRID module. The projected grids were clipped to the MassGIS Orthophoto Index and converted to grayscale images. The 1-meter images (15 megabytes each) were resampled for 2- (4 mb) and 5- (640 kb) meter resolution. All three resolution images are stored in tiff format with .TFW header files. The images are named according to their resolution and Orthophoto Index SHEET-ID, separated with the letter 'u' to distinguish them from overlapping 1:5000 orthophotos (example names: 1u125918.tif, 2u125918, 5u125918.tif).

ATTRIBUTES

There are no attrribute for the images. Each pixel is coded with a gray-shade value ranging from 0-255. See http://nsdi.usgs.gov/nsdi/wais/maps/doqmet.html on the Web for full metadata.

AVAILABILITY

These images are available for Franklin County and portions of the south shore and Northern Middlesex regions. They will serve as the orthophoto base for the region until the 1:5000 orthos from the Executive Office of Environmental Affairs' (EOEA) orthophoto mapping project become availabile. Original dates of photography, obtained from the USGS images' headers, are April 28, 1992 for Franklin County and April, 1995 for the other regions.

MAINTENANCE

This datalayer is maintained by MassGIS.

Coastal Color Orthophotographs
February 1998

OVERVIEW

The color coastal orthophotographs were generated through a cooperative effort between the Massachusetts Coastal Zone Management Office, the NOAA Photogrammetry Division and the National Geodetic Survey. The data covers most of the coastal zone region. Photo Science Inc. of Gaithersburg Maryland provided digital orthophoto production.

PRODUCTION

The Photogrammetry Division of NOAA captured the color aerial photography in September and October of 1994. The scale of the original photography is 1:48,000. Differential airborne GPS was used for control. Approximately 31 flight lines were conducted, with the orientation of the flight lines designed to cover the maximum area of shoreline. Approximately 360 were captured. Approximately 16 ground panels were placed in the field and surveyed.

The Photogrammetry Division utilizing analytical stereo plotters conducted Aerotriangulation. The control was processed using 3 block areas: A) North of Boston, B) Boston south including the Elizabeth Islands, and C) Martha's Vineyard with Nantucket. Control was developed to provide an accuracy that exceeds NMAS of 1:10,000. In large portions of the area, control exceeds the NMAS for 1:7,000.

Diapositives were scanned for a final output resolution of 1.0 meter. Scanning was done to match the diapositives as closely as possible. Bulk radiometric adjustments of the imagery was conducted using Adobe Photoshop "auto levels" to remove the green haze and to stretch the contrast.

Mass point and breakline elevations were created and used in the production. Only mass point elevations are available for the area. Elevation data was developed primarily for the purpose of orthorectification, and not for detailed contouring.

The data set is tiled identically to the MassGIS black and white orthophotos for the mainland region. Data for Martha's Vineyard and Nantucket islands are in the Massachusetts Island State Plane Coordinate Zone. The tiling for the islands is similar to the scheme used on the mainland. The origin of the island zone tile scheme is not based on a mainland grid projected to an island zone. Because the original color orthophotography data development area is not identical to this tiling scheme, portions of some color othrophotograph tiles appear blank. These are inland areas where color orthophotography is not available.

The original 1-meter tiles are 48 MB per tile. 2-meter versions of the tiles are available, and are 12 MB apiece. There are 341 tiles in the mainland, 73 tiles on the island for a total of 414 tiles. The files are stored in TIFF format and are accompanied by .tfw header files.

MassGIS also distributes these images in the MrSID format. MrSID (Multi-resolution Seamless Image Database) is a product of Lizardtech, Inc. that uses wavelet technology to achieve high compression levels within images with minimal loss of image quality. Each one-meter tiff has been compressed at a 20:1 compression ratio with eight zoom levels. Each one-meter SID image is named 1c<sheet-ID>.sid, accompanied by an associated .sdw header file for use in ArcView 3.1 with the MrSID Image Extension. The SID images may also be viewed with the free MrSID Image Viewer, available on the Web at http://www.lizardtech.com, or in other software that supports the .sid format.

USGS Topographic Quadrangle Images Datalayer
December 1995

OVERVIEW

MassGIS scanned the USGS 7.5-minute series topographic quadrangles to create a digital database that can provide images of the paper maps. These images can be used as a backdrop for plotting vector data, and for interpretation and analysis. **The images are indexed by the Digital Orthophoto Quad (DOQ) Index**, producing 1600 images for the 189 paper quads. The image name is an index sheet-ID composed of the first three digits of the x and y NAD83 state plane coordinates of the image's lower right corner, prefixed by the letter 'Q'. For example an image that covers part of Northfield, MA, with lower right corner coordinates of 125000m 983000m, is named Q125938.

PRODUCTION

The paper maps were converted to image format by scanning. Unfolded USGS quadrangles were used if available. The maps were scanned with a Tangent CCS500-50TF drum scanner at 250 dots per inch (dpi) into 8 bit compressed TIFF images. Each scanned quad was registered to MA State Plane NAD27 in ARC with REGISTER. After registration, the images were converted to grids in GRID where they were then clipped of map marginalia and merged with neighboring sheets. The resulting grid was projected into NAD83 MA State Plane meters. Afterwards, the grid was clipped by a DOQ template and each clipped grid was converted back into a TIFF image. The quad images will be stored with this tiling scheme to facilitate storage of the images and allow for faster drawing times for local map extents.

MassGIS also distributes these images in the MrSID format. MrSID (Multi-resolution Seamless Image Database) is a product of Lizardtech, Inc. that uses wavelet technology to achieve high compression levels within images with minimal loss of image quality. Each scanned quad image has been compressed at a 10:1 compression ratio with eight zoom levels. Each SID image is named q<sheet-ID>.sid, accompanied by an associated .sdw header file for use in ArcView 3.1 with the MrSID Image Extension. The SID images may also be viewed with the MrSID Image Viewer, available free at http://www.lizardtech.com, or in other software that supports the .sid format.

NOAA Nautical Chart Images Datalayer
June 2001

OVERVIEW

MassGIS created a digital database of the paper nautical charts produced by the National Oceanic and Atmospheric Administration (NOAA) that cover the coastal areas of Massachusetts. These images provide a graphic portrayal of the marine environment, showing the nature and form of the coast, the depths of the water and general character and configuration of the sea bottom, locations of dangers to navigation, the rise and fall of the tides, locations of man-made aids to navigation, and the characteristics of the Earth's magnetism. In addition to providing these basic elements, nautical charts are working documents used by the mariner both as a "road map" and worksheet and are essential for safe navigation. **In conjunction with supplemental navigational aids,** they are used to lay out courses and navigate ships by the shortest and most economically safe route.

Today, nautical charts are used by the Departments of Defense and Transportation, state and local governments, commercial shippers, the fishing industry, and recreational boaters throughout the United States. Navigational charts and Coast Pilots (a series of nautical books that cover a variety of information important to navigators of coastal and intracoastal waters and the Great Lakes) are integral components necessary for safe and efficient navigation within U.S. and territorial waterways. Federal law requires all ships in excess of 1600 gross tons to have and use current editions of these navigation products. Charts and hydrographic surveys are also used by environmental groups, academia, and coastal zone planners.

DISCLAIMER: It is important to note that these images alone should not be used for navigational purposes. Because of recent updates and limitations on scale, the NOAA Nautical Chart Images distributed by MassGIS should be used primarily as a backdrop display, for plotting vector data, and for interpretation and analysis. Mariners should always consult Coast Pilots and local port authorities and harbormasters and check water and weather conditions. MassGIS, the Commonwealth of Massachusetts, and the Executive Office of Environmental Affairs do not assume responsibility for the improper use of these data.

A vector index coverage was created from the bounding coordinates of each image in ArcInfo. This coverage, named **NOAAINDX** for both layer and coverage, is stored in the NE library and may be used to reference the location of each chart. Use the CHART item in the REGION.CHART subclass as the selection field.

PRODUCTION

The paper maps were converted to image format by scanning. See the table below for the names, scales, and dates of the maps that MassGIS used in this project. The maps were scanned with a Tangent CCS500-50TF drum scanner at 250 dots per inch (dpi) into 8 bit compressed pseudo-color TIFF images. Each scan was registered using ArcInfo's REGISTER command to the Mercator projection (the projection of the paper maps) using degrees-minutes-seconds latitude/longitude coordinates listed on each map, as well as each chart's specific latitude of true scale and central meridian. The DMS coordinates were converted to Mercator by way of an intermediate projection through the Universal Transverse Mercator projection, a step required to work around a software bug in ArcInfo. The Mercator-based images were then converted to Grids and projected to the MA State Plane Mainland Zone coordinate system, datum NAD83, units meters in ArcInfo. After registration, the grids were clipped of map marginalia to allow seamless display with adjacent images. Depending on the layout of each chart, some images were clipped into multiple pieces for faster display, eliminating the need to draw large non-data areas. Additionally, some charts contained larger-scale inset maps of harbors and small inlets. These were clipped out of the main chart image and registered separately.

Following this initial round of registration, the georeferencing of some images was further fine tuned by matching to features in the Nautical data layer, which contains NOAA chart major linework with

high spatial accuracy such as channel boundaries and pipelines. As a result, some images, especially large scale inset maps, may appear not to align properly with smaller-scale vector data (e.g. the 1:25,000 Town Boundaries). Each grid then was converted back into a TIFF image, with the ".tif" file extension for the image and ".tfw" for the header file (which stores georeferencing information used for proper display by GIS software). Each TIFF image was converted into the MrSID image file format at 30:1 compression and eight zoom levels. MrSID files have the ".sid" (image) and ".sdw" (header) file extensions. MassGIS makes available both the TIFF and MrSID versions of the images. With clipping and inset maps, 67 total images were produced.

Each image file is named according to the five-digit number assigned by NOAA, prefixed with the letter 'n'. An 'e' or 'w' after the number indicates eastern and western portions of the chart. Charts that have been clipped into multiple pieces have an underscore character followed by a number (e.g. n13227_2). Inset maps contain the letter 'i' after the five-digit number. If multiple inset maps were clipped from one original chart image, each file name has an additional 'a', 'b' or 'c' after the 'i' (e.g. n13238ia, n13238ib).

The following table lists the file name, chart title and original paper map scale and date of printing for all the images in this layer.

File Name	Chart Title	Scale	Date
n13003	Cape Sable To Cape Hatteras	1200000	7/22/95
n13006	West Quoddy Head To New York	675000	3/5/94
n13009	Gulf Of Maine And Georges Bank	500000	3/11/95
n13200	Georges Bank And Nantucket Shoals	400000	9/11/93
n13204e n13204w	Georges Bank, Eastern Part	220000	7/7/90
n13218	Marthas Vineyard To Block Island	80000	6/26/93
n13221	Narragansett Bay	50000	4/15/95
n13226 n13226_2 n13226_3 n13226_4 n13226_5 n13226_6	Mount Hope Bay	20000	12/12/92
n13227 n13227_2	Fall River Harbor	10000	4/14/90
n13227i	Fall River Harbor - State Pier	2500	4/14/90
n13228	Westport River And Approaches	20000	6/13/92
n13230 n13230_2	Buzzards Bay	40000	4/29/95
n13230i	Buzzards Bay - Quicks Hole	20000	4/29/95
n13233 n13233_2 n13233_3 n13233_4	Marthas Vineyard	40000	11/28/92
n13233i	Marthas Vineyard - Menemsha Pond	20000	11/28/92
n13235	Woods Hole	5000	8/13/91
n13236 n13236_2 n13236_3	Cape Cod Channel And Approaches	20000	4/2/94
n13237	Nantucket Sound And Approaches	80000	6/18/94
n13238 n13238_2	Marthas Vineyard (Eastern Part)	20000	6/27/92
n13238ia	Oak Bluffs Harbor	10000	6/27/92
n13238ib	Vineyard Haven Harbor	10000	6/27/92
n13238ic	Edgartown Harbor	10000	6/27/92
n13241	Nantucket Island	40000	6/6/92
n13244	Eastern Entrance To Nantucket Sound	40000	11/26/94

n13246	Cape Cod Bay	80000	9/25/93
n13248	Chatham Harbor And Pleasant Bay	20000	4/7/90
n13249	Provincetown Harbor	20000	8/16/90
n13250 n13250_2	Wellfleet Harbor	40000	8/18/89
n13250i	Sesuit Harbor	10000	8/18/89
n13251	Barnstable Harbor	20000	7/29/89
n13253 n13253_2	Plymouth, Kingston And Duxbury Harbors	20000	3/5/88
n13253i	Green Harbor	10000	3/5/88
n13260	Bay Of Fundy To Cape Cod	378838	10/16/93
n13267 n13267_2	Massachusetts Bay (Outer Boston Harbor)	80000	1/1/94
n13267i	North River	20000	1/1/94
n13269	Cohasset And Scituate Harbors	10000	6/9/90
n13270	Boston Harbor	25000	1/7/95
n13272 n13272_2	Boston Inner Harbor	10000	6/28/95
n13275 n13275_2	Salem and Lynn Harbors	25000	10/9/93
n13275i	Manchester Harbor	10000	10/9/93
n13276	Salem, Marblehead and Beverly Harbors	10000	8/5/95
n13278	Portsmouth To Cape Ann	80000	6/10/95
n13278i	Hampton Harbor	30000	6/10/95
n13279 n13279_2	Ipswich Bay To Gloucester Harbor	20000	4/22/95
n13279i	Rockport Harbor	5000	4/22/95
n13281	Gloucester Harbor And Annisquam River	10000	6/3/95
n13282	Newburyport Harbor and Plum Island Sound	20000	3/23/91

ATTRIBUTES

The images files do not contain attributes. Sounding values on the images with scales 2,500 - 80,000 are in feet at mean low water. Soundings on smaller scale maps are in fathoms.

The **NOAAINDX.PATCHART** region attribute table for the index coverage contains the following item:

ITEM NAME	WIDTH	OUTPUT	TYPE
CHART	7	7	C

ADDITIONAL REFERENCES

When using these NOAA Chart images, it may be helpful to refer to these Web sites, which contain a multitude of links, including user manuals, map symbol descriptions and more:
- NOAA's "Office of Coast Survey" - http://chartmaker.ncd.noaa.gov/
- "Navigational Charts" - http://chartmaker.ncd.noaa.gov/staff/charts.htm

MassGIS does not sell or distribute paper copies of the NOAA Nautical charts. Such maps may be viewed at some major libraries and are for sale from Authorized Nautical Chart Sales Agents (view a list online at http://chartmaker.ncd.noaa.gov/NSD/states.html) and other vendors.

In addition, the National Ocean Service Mapfinder Web site (http://mapfinder.nos.noaa.gov/) provides online viewing of NOAA Chart images.

Forested Landcover Images Datalayers
July 1999

OVERVIEW

MassGIS has derived two images representing forested area in the Commonwealth for use in the Massachusetts Resource Identification Project:

1) The GAP Forest datalayer is a derivative of the Southern New England Vegetation datalayer, a GAP project component. An image was created from the original GAP SNEVEG 1.0 data set (in ARC/INFO Grid format) by selecting the following landcover classes (alliance level):
   Forested Wetland, Suburban Forest, Conifer, Mixed, Oak/Maple/Birch, Birch Dominant, Oak Dominant, Red Maple Dominant, Northern Hardwoods

2) The MRLC Forest datalayer is a derivative of the National Land Cover Datalayer (NLCD) developed from Thematic Mapper satellite data acquired by the Multi-Resoultion Land Characterization (MRLC) Consortium. The following landcover classes (with class numbers in parentheses) were selected from the original MRLC NLCD data set (in ARC/INFO Grid format):
   - Deciduous Forest (41) - Areas dominated by trees where 75 percent or more of the tree species shed foliage simultaneously in response to seasonal change.
   - Evergreen Forest (42) - Areas dominated by trees where 75 percent or more of the tree species maintain their leaves all year. Canopy is never without green foliage.
   - Mixed Forest (43) - Areas dominated by trees where neither deciduous nor evergreen species represent more than 75 percent of the cover present.
   - Deciduous Shrubland (51) - Areas dominated by shrubs where 75 percent or more of the shrub species shed foliage simultaneously in response to seasonal change.
   - Woody Wetlands (91) - Areas of forested or shrubland vegetation where the soil or substrate is periodically saturated with or covered with water as defined by Cowardin et al.

New Grids were created from their respective subsets and then converted to Tiff images in ARC/INFO. Both images are available in Tiff and MrSID format. File names are as follows:

	Gap Forest	MRLC Forest
Tiff	gap-for.tif	mrlc-for.tif
MrSID	gap-for.sid	mrlc-for.sid

ATTRIBUTES

There are no attributes associated with the images. Creating a map legend for the GAP and MRLC Forest images may be achieved by using the CODE item in the coverage MRLCLEG. Values of CODE correspond to the classes of forest type. MassGIS has created two ArcView legend files - gapfor.avl and mrlcfor.avl – to be used for this purpose. The legend files and coverage (in ESRI Shapefile and Arc/Info Export File formats) are distributed with the images.

These derived images depicting select forest class information allow users to directly focus on forest-related landcover, without first having to extract the features from a larger dataset with many additional landcover classifications. Providing the information in image format extends the data to GIS users who do not have GIS software supporting the ARC/INFO Grid format. The GAP SNEVEG and MRLC NLCD datalayers may be obtained in Grid format with original attribute information per special request from MassGIS.

ADDITIONAL INFORMATION

Development of the GAP Forest datalayer: http://outsider.fnr.umass.edu/gaphome.html.
GAP Project: http://www.gap.uidaho.edu/gap/
Development of the MRLC Forest datalayer: http://edcwww.cr.usgs.gov/programs/lccp.

Community Boundaries (Towns) Datalayer
March 1991

OVERVIEW

The political boundary datalayer is a 1:25,000 scale datalayer containing the boundaries of the 351 communities in Massachusetts. The seaward boundary of coastal communities has been defined at mean high water in this datalayer. This datalayer is stored as a single statewide coverage, **TOWNS**, in the STATE library.

PRODUCTION

This datalayer, except the coastline, was digitized by MassGIS from a set of stable based film prints of the 1:25,000 7.5' quadrangles purchased from the USGS by the Massachusetts Dept. of Public Works. The coastline was taken from the USGS 1:100,000 hydrography DLG database. It was selected visually and appended to the digitized town boundaries.

ATTRIBUTES

Several items have been added to the **TOWNS.PAT**

ITEM NAME	WIDTH	OUTPUT	TYPE	N.DEC	ALTERNATE NAME	Contents
AREA	4	12	F	3		Area in square meters
PERIMETER	4	12	F	3		Perimeter in meters
TOWNS#	4	5	B	0		
TOWNS-ID	4	5	B	0		
TOWN-ID	4	5	B	0	MASSGIS-TOWN-COD	MassGIS Town-ID Code (alphabetical, 1-351)
TOWN	21	21	C	-	TOWN-NAME	Town Name
FIPS-STCO	5	5	I	-	FIPS-ID	Federal Information Processing Standard (FIPS) State/County Code
CCD/MCD	3	3	C	-	CENSUS-TOWN-CODE	US Census Town Code
FIPS-PLACE	5	5	C	-	FIPS-TOWN-CODE	Federal Information Processing Standard (FIPS) Town Code
POP80	7	9	I	-	CEN-POPULATION80	US Census Town Population: 1980
POP90	7	9	I	-	POP	US Census Town Population: 1990
ISLAND	1	1	I	-		Polygon is (1)/is NOT (0) an island - many towns are composed of many polygons.
*** REDEFINED ITEMS ***						
FIPS-MCD	8	8	I	-	FIPS+CEN-TOWN-CO	FIPS State & County & Census Town Code concatenated
FIPS-COUNTY	3	3	I	-	COUNTY-CODE	FIPS County only code

A **TOWNS.AAT** was created and an item added called OUTLINE that identifies the outside polygon of the state. This enables differentiation of line type (e.g. dashed lines inside the state and solid for the outside). The outline = 1, internal boundaries = 17 (a dashed line in the MassGIS default symbolset).

Annotation has been added to the coverage. Level 1 places town names within the town boundaries while levels 2 and 3 place annotation along town boundaries.

RELATED DATABASE FILES

TOWNS.AREACODE stores telephone area codes for each municipality and reflects the addition of four new "overlay" codes in Massachusetts (339, 351, 774, 857) that took effect on April 2, 2001. For more information on the Commonwealth's area codes, see Verizon's Massachusetts' area codes Web page at http://www.bellatlantic.com/areacode/pages/ma.htm.

ITEM NAME	WDTH	OPUT	TYPE	N.DEC	ALT. NAME	Contents
TOWN-ID	8	11	F	0	TOWN_ID	Town ID, used to relate to TOWNS.PAT
AREACODE	4	3	B	-		Town Area Code (413, 508/774, 617/857, 781/339, 978/351)

TOWNS.MWRATOWN stores information on which towns receive water and/or sewer service from the Massachusetts Water Resources Authority.

ITEM NAME	WDTH	OPUT	TYPE	N.DEC	Contents
TOWNS_ID	8	16	F	0	Relates to TOWNS-ID in TOWNS.PAT
CODE	2	2	C	-	Service Code: S = Sewer only W = Water only

WS = Water and Sewer   N = No service

TOWNS.ESTDEV - Estimated Acres of Development - was created for the Massachusetts Audubon report, "Losing Ground II". The table stores estimated development figures from a predictive model created by consultants Phillip Herr and Associates. An ARC/INFO relate was established between the MassGIS Towns coverage and an attribute table provided by Herr and Associates. Values of the item AC_SQMI are normalized representations of estimated development (commercial and residential) expressed as acres per square mile by each community, not the total number of acres predicted to be developed.

ITEM NAME	WDTH	OPUT	TYPE	N.DEC	Contents
TOWN-ID	8	11	F	0	Town ID, used to relate/join to TOWNS.PAT
AC_SQMI	8	16	F	4	See description in above paragraph

TOWNS.SPECDENS - Species Density - was created for the Massachusetts Audubon report, "Losing Ground II". It enables general display of the density (not the actual locations) of rare, threatened, and special concern species within Massachusetts communities. This table was developed from an ARC/INFO relate between the MassGIS Towns datalayer and an element occurrence (EO) database (1974-1999) provided by the Natural Heritage & Endangered Species Program's (NHESP) Biological and Conservation Data System. Values in the EO_SQMI field represent species (element) occurrences per square mile (density) within each community, as opposed to categorizing communities based upon the sum of EO records per community as displayed in the recent publication, "Our Irreplaceable Heritage".

ITEM NAME	WDTH	OPUT	TYPE	N.DEC	Contents
TOWN-ID	8	9	F	0	Town ID, used to relate/join to TOWNS.PAT
EO_SQMI	8	16	F	2	See description in above paragraph

TOWNS.RDDENS - Road Density - was created for the Massachusetts Audubon report, "Losing Ground II". Its intended use is to provide a general indication of the amount and density (i.e. level of fragmentation) of road development within Massachusetts communities. It does not display where roads are located within each community and therefore should be used for general planning purposes only. This table was developed from an ARC/INFO union between the MassGIS Towns and Mass. Highway Department Roads datalayers. Values in the FEET_ACRE field represent total road length in feet per acre, per community. All classes of roads were included in the assessment.

ITEM NAME	WDTH	OPUT	TYPE	N.DEC	Contents
TOWN-ID	8	9	F	0	Town ID, used to relate/join to TOWNS.PAT
FEET_ACRE	8	16	F	2	See description in above paragraph

Community Boundaries without Coast Datalayer
April 1992

OVERVIEW

The political boundary coverage is a datalayer containing onshore and offshore boundaries for the 351 communities of Massachusetts. Note that **no** coastline appears in this data.

This datalayer is stored as a single statewide coverage, **BOUNDARY**, in the STATE library.

MANUSCRIPT

Sources of this data are Chapter 196 Acts of 1881 boundaries drafted onto 1:80,000 NOAA charts and town boundaries from the USGS 1:25,000 topographic series published on stable based film.

ATTRIBUTES

The coverage .AAT has an item, **TYPE**, that allows you to choose either onshore boundaries ('dry') with **TYPE = 1**, or offshore boundaries ('wet') with **TYPE = 2**.

This data layer also has a .PAT with the following items:

ITEM NAME	WDTH	OPUT	TYPE	N.DEC	ALTERNATE NAME	DESCRIPTION
AREA	4	12	F	3		
PERIMETER	4	12	F	3		
BOUNDARY#	4	5	B	0		
BOUNDARY-ID	4	5	B	0		
TOWN-ID	4	5	B	0	MASSGIS-TOWN-COD	MassGIS Town-ID Code (alphabetical, 1-351)
TOWN	21	21	C	-	TOWN-NAME	Town Name
FIPS-STCO	5	5	I	-	FIPS-ID	Federal Information Processing Standard State/County code
CCD/MCD	3	3	C	-	CENSUS-TOWN-CODE	US Census Town code
FIPS-PLACE5	5	C	-		FIPS-TOWN-CODE	Federal Information Processing Standard Town code
POP80	7	9	I	-	CEN-POPULATION80	US Census Town population 1980
POP90	7	9	I	-	POP	US Census Town population 1990

PRODUCTION

MassGIS digitized the onshore community boundaries from a set of stable based film prints of the 1:25,000 7.5' USGS quadrangles. Offshore boundaries were digitized by DFWELE from 1:80,000 NOAA charts. The two were merged into one complete boundaries coverage. Along the eastern portion of the state offshore boundaries include those town boundaries that fall within rivers and other water bodies. For western Massachusetts all town boundaries are currently coded as onshore, 'dry' boundaries.

Note: The outer boundaries based on the Acts of 1881 do not necessarily coincide with the limits of the state territorial waters or state or town jurisdiction.

MAINTENANCE

MassGIS and DFWELE are maintaining this datalayer.

County Boundaries Datalayers
March 1991

OVERVIEW

MassGIS derived the boundaries of the 14 counties in Massachusetts from the community boundaries datalayers. Two statewide coverages are available:
- **COUNTIES** - contains the 1:100,000 coastline (from the TOWNS coverage)
- **COUNTYNC** - contains the full municipal boundaries extending offshore (from the BOUNDARIES coverage).

PRODUCTION

Using ARC/INFO, the TOWNS and BOUNDARIES layers were dissolved based on the FIPS_STCO field.

ATTRIBUTES

The **COUNTIES.PAT** contains these items:

FIPS-ID	Federal Information Processing Standard state/county code
COUNTY	County name
AREA-ACRES	County area in acres

The **COUNTYNC.PAT** contains this item:

FIPS-COUNTY	the unique identifier for each quad corner
FIPS-ID	Federal Information Processing Standard state/county code
COUNTY	County name

The FIPS-ID - County pairs are as follows:

FIPS-ID	COUNTY
25001	BARNSTABLE
25003	BERKSHIRE
25005	BRISTOL
25007	DUKES
25009	ESSEX
25011	FRANKLIN
25013	HAMPDEN
25015	HAMPSHIRE
25017	MIDDLESEX
25019	NANTUCKET
25021	NORFOLK
25023	PLYMOUTH
25025	SUFFOLK
25027	WORCESTER

MAINTENANCE

MassGIS is maintaining these layers. Middlesex, Franklin, Hampden, and Worcester Counties have been dissolved by the state Legislature. The Franklin Regional Council of Governments has banded as a volunteer organization to include towns of the former county.

State Outlines Datalayers
March 1991

OVERVIEW

Two datalayers are available that represent the outline of the Commonwealth of Massachusetts:
- **OUTLINE** - contains the state outline with a 1:100,000 coastline
- **OUTLN25** - contains the state outline with a 1:25,000 coastline

PRODUCTION

For the both layers, MassGIS digitized 1:25,000 linework from U.S. Geological Survey mylar map sheets for land boundaries. For the OUTLINE layer, a 1:100,000 coastline was extracted from USGS Digital Line Graphs. For OUTLN25, the coastline from the 1:25,000 Hydrography layer was used. All processing was done in ARC/INFO.

ATTRIBUTES

The **OUTLINE.PAT** contains this item:

AREA-ACRES   Polygon area in acres

The **OUTLINE.AAT** contains this item:

SYMBOL   1 = Inland boundary
                4 = Coastline (100k)

The **OUTLN25.AAT** contains these items:

COAST   Y = Coastline (25k)
                N = Inland boundary

SYMBOL   0 = Coastline (25k)
                5 = Inland boundary

MAINTENANCE

MassGIS is maintaining these layers.

Quadrangle Template Datalayer
March 1989

OVERVIEW

MassGIS has adopted the Massachusetts State Plane Coordinate System (SPC) as its standard coordinate reference system, using the mainland zone throughout the state. The quadrangle template datalayer contains the boundaries and Massachusetts State Plane Coordinate values of the corners of the 189 1:25,000 USGS topographic sheets that cover Massachusetts. This datalayer is of great utility to any project planning to digitize information that has been compiled onto the 1:25,000 quad sheets because it insures that the data will register to the other datalayers in the MassGIS system.

This datalayer is stored as a single statewide coverage, **QUADS**, in the STATE library.

PRODUCTION

MassGIS project staff devised a simple numbering system to identify each quadrangle and the corners of all quadrangles. Staff then used NADCON to translate the longitude and latitude of the quadrangle corners into Massachusetts State Plane Coordinate values. These values were put into an INFO database and used to generate an Arc/INFO datalayer. Arcs delineating the quadrangle borders were also generated.

ATTRIBUTES

The **QUADS.PAT** contains two items of note:

QUAD-NAME	the USGS name for each quadrangle
QUAD_ID	the unique identifier for each quadranglee

The **QUADS.TIC** contains three items:

IDTIC	the unique identifier for each quad corner
XTIC	the number of feet east of the SPC origin
YTIC	the number of feet north of the SPC origin

EDITING

MassGIS carefully proofread the SPC coordinates of the quad corners. Many plots were made at 1:25,000 and smaller scales.

NOTE: This datalayer, as all other data in the MassGIS database, is stored in NAD83. Please be sure to project this coverage back to NAD27 if you intend to digitize from a 1:25,000 USGS paper quadrangle. The tics of this coverage are the NAD27 tic marks on both the single and doublewide USGS maps.

Digital Quadrangle Template Datalayer
April 1993

OVERVIEW

U.S. Geological Survey's Digital Line Graph (DLG) data is available through MassGIS. The paneling scheme for the 1:25,000 (DLG) data is based on this digital quadrangle template of 210 quadrangles. The grid differs from the Quadrangle Template, which is based on the 1:25,000 USGS 7.5 minute topographic quadrangles. For most of Massachusetts, though, the paneling schemes are identical. The quadrangle panels and numbering scheme vary along the coast, primarily for the Cape and Islands quads. Please refer to the appendix for a map of both grids and a listing of the corresponding datalayers that are paneled by each grid.

This datalayer is stored as a single statewide coverage, **USGSGRID**, in the STATE library.

PRODUCTION

The coverage was generated by the Arc/INFO GENERATE command. Using the PROJECT command, the coverage was projected into Massachusetts State Plane Feet, NAD27. The coverage was then built and attributes added to the polygons to identify the digital quadrangles. One additional quad was added to the coverage for ease of processing some of the coastal data. This quadrangle (DIG-ID = 158-S), however, may not correspond to USGS DLG data. The coverage has since been projected into the Massachusetts State Plane Coordinate System, NAD83 meters.

ATTRIBUTES

The **USGSGRID.PAT** contains the two items to identify each quadrangle:

QUAD-NAME	25	25	C	Quadrangle name
DIG-ID	5	5	C	Quadrangle identifier; may have a -W,-E or other extension

MAINTENANCE

This datalayer is being maintained by MassGIS.

MA State Plane Grid and Points Datalayer
March 1989

OVERVIEW

MassGIS has adopted the Massachusetts State Plane Coordinate System (SPC) as its standard coordinate reference system, using the mainland zone throughout the state. MassGIS has generated an SPC point coverage called **GRID10K**. Using a grid with 10,000 feet on a side, the points were derived from the grid intersections. This coverage can be plotted on a map as coordinate reference. The plotting of coordinates on a map enables that map to be used as a compilation manuscript for further data automation. The points can be used as 'TICS' to register the plot/manuscript on the digitizing table. This is of great utility to any project planning to digitize information that needs to be compiled onto GIS plots because it insures that the new data will register to the other datalayers in the MassGIS system.

This datalayer is stored as a single statewide coverage, **GRID10K**, in the STATE library.

PRODUCTION

MassGIS staff produced GRID10K using the Arc/INFO command GENERATE. The grid starts at the origin of the Massachusetts SPC Mainland Zone and has a grid block size of 10,000 feet on a side. MassGIS then made the point coverage by using the Arc/INFO command NODEPOINT, in which each node of the grid was converted into a point in the new datalayer. Next the SPC northing and easting of each point was added to the attribute database (.PAT) using the command ADDXY.

ATTRIBUTES

The **GRID10K.PAT** contains two items of note:

X-COORD   the number of feet east of the SPC origin
Y-COORD   the number of feet north of the SPC origin

EDITING

MassGIS carefully proofread the SPC coordinates of the quad corners.

MAINTENANCE

MassGIS is maintaining this datalayer.

UTM Grid and Points Datalayers
May 1996

OVERVIEW

The Universal Transverse Mercator (UTM) grid is an X-Y coordinate system used as a reference on medium- to small-scale maps for representing the three-dimensional curved surface of the earth on a 2-D plane (e.g. a map or computer screen). In this grid, the world is divided into 60 north-south zones, each covering a strip 6° wide in longitude. These zones are numbered consecutively beginning with Zone 1, between 180° and 174° west longitude, and progressing eastward to Zone 60, between 174° and 180° east longitude. Thus, the conterminous 48 States are covered by 10 zones, from Zone 10 on the West Coast through Zone 19 in New England. In each zone, coordinates are measured north and east in meters. (One meter equals 39.37 inches, or slightly more than 1 yard.) The northing values are measured continuously from zero at the Equator, in a northerly direction. Southerly values are similarly measured from the Equator, south. A central meridian through the middle of each 6° zone is assigned a "false" easting value of 500,000 meters. Grid values to the west of this central meridian are less than 500,000; to the east, more than 500,000.

MassGIS provides 2 datalayers - **UTMGRID** and **UTMPTS** - which represent this referencing system for the parts of the two Zones (18 and 19) that cover Massachusetts. Both layers reside in the STATE library. UTMGRID is a polygon/line coverage that can be plotted on a map as a coordinate reference. UTMPTS is a point layer that represents the nodes (line intersections) of the UTMGRID layer.

PRODUCTION

MassGIS staff produced UTMGRID using the ARC/INFO command GENERATE. Because two Zones cross Massachusetts and meet at the 72-degrees line of longitude (west of Worcester), each was generated separately, converted to the Mass. Stateplane Mainland coordinate system, and then joined in Arc with MAPJOIN. Consequently, along the "seam" of the two zones the grid blocks have varying sizes and shapes. (Traditionally, map series that use the UTM system, i.e. USGS Topographic Maps, are tiled so that no two zones appear in the same map sheet, thus avoiding such geometric inconsistency.) MassGIS then made the point coverage by using the ARC/INFO command NODEPOINT, in which each node of the grid was converted into a point in UTMPOINT.

ATTRIBUTES

The **UTMGRID.PAT** contains the following item:

ZONE   = 18 to the west of 72-degrees longitude
              = 19 to the east of 72-degrees longitude

MAINTENANCE

MassGIS is maintaining these datalayers. For additional resources on the UTM coordinate system, visit the following Web sites:
- http://www.nps.gov/prwi/readutm.htm
- http://mapping.usgs.gov/mac/isb/pubs/factsheets/fs15799.html

Latitude/Longitude Graticules Datalayers
August 1995

OVERVIEW

Two coverages are available that represent the graticule of latitude and longitude linework that covers Massachusetts:

- **MINLL1** - 1-minute latitude-longitude lines
- **MINLL10** - 10-minute latitude-longitude lines

These 2 coverages are stored in the NE library and are meant to be used for general planning and educational purposes.

PRODUCTION

The Mass. Department of Fisheries and Wildlife used ARC/INFO to generate points in Degrees-Minutes-Seconds coordinates, which were then projected to the Mass. State Plane coordinate system. The points were then used to create line coverages.

ATTRIBUTES

The **MINLL10.AAT** contains these items:

LAT	Latitude value of the line ("NA" if line is longitudinal)
LONG	Longitude value of the line ("NA" if line is latitudinal)
LINE_0	Indicates whether the line is a 00 seconds line (i.e. 44 00 00)

The **MINLL1.AAT** does not contain any items other than those standard in an arc attribute table.

MAINTENANCE

MassGIS is maintaining these layers.

Massachusetts House Legislative Districts Datalayer
January 2001

OVERVIEW

The Massachusetts House Legislative Districts datalayer reflects the House district boundaries as defined by Chapter 273 of the Acts of 1993. Names of elected officials are up-to-date through January 2001.

This datalayer is stored as a single statewide coverage, **HOUSE93**, in the STATE library.

PRODUCTION

Election Data Services, Inc (Washington, DC) produced the coverage under contract to the Massachusetts House of Representatives. The coastline was appended to the coverage by Applied Geographics (Boston, MA) with additional editing completed by MassGIS. The datalayer was created to produce the Massachusetts House Legislative Districts Map dated August 30, 1994. The Districts map is available at the Massachusetts State House Bookstore.

ATTRIBUTES

The HOUSE93.PAT has the following items; the last three are of note:

ITEM NAME	WIDTH	OUTPUT	TYPE	N.DEC
AREA	4	12	F	3
PERIMETER	4	12	F	3
HOUSE93#	4	5	B	
HOUSE93-ID	4	5	B	
NAME	64	64	C	
COLORS	16	16	I	
LABEL	2	3	I	
INSET	2	3	I	
HOUSE_LEGISLATIVE	25	25	C	
NUMBER	3	3	I	

HOUSE_LEGISLATIVE is the name of the district, while NUMBER is a unique number for each district. INSET helps to identify urbanized areas for producing a large scale map inset.

In HOUSE93.AAT, item COAST distinguishes between state and internal boundaries. To select the state boundary, reselect arcs where COAST = 1.

Massachusetts Senate Legislative Districts Datalayer
January 2001

OVERVIEW

The Massachusetts State Senate Legislative Districts datalayer reflects the State Senate district boundaries as defined by Chapter 274 of the Acts of 1993. Names of elected officials are up-to-date through January 2001.

This datalayer is stored as a single statewide coverage, **SENATE93**, in the STATE library.

PRODUCTION

Election Data Services, Inc (Washington, DC) produced the coverage under contract the Massachusetts Senate. A coastline was appended to the coverage by Applied Geographics (Boston, MA) with additional editing completed by MassGIS. The datalayer was created to produce the Massachusetts State Senate Legislative Districts Map dated April 7, 1994. The Districts map is available at the Massachusetts State House Bookstore.

ATTRIBUTES

The SENATE93.PAT has the following items; the last described below are of note:

COLUMN	ITEM NAME	WIDTH	OUTPUT	TYPE	N.DEC
1	AREA	4	12	F	3
5	PERIMETER	4	12	F	3
9	SENATE93#	4	5	B	-
13	SENATE93-ID	4	5	B	-
17	NAME	64	64	C	-
81	DIST-NUM	10	10	I	-
91	COLOR	2	3	I	-
93	COLORS	4	4	I	-
97	LABEL	3	3	I	-
100	SENATORS	40	40	C	-
140	DIST-NAME	40	40	C	-

SENATORS is the item identifying the Senator of the District, DIST-NAME is the name of the district and DIST-NUM is a unique number for each district.

In SENATE93.AAT, the item COAST differentiates between district boundaries that are also state boundaries (COAST = 1) and internal boundaries.

Digital Orthophoto Index Datalayers
June 2001

OVERVIEW

The Digital Orthophoto Index layer is a 4,000 by 4,000 meter grid in MA State Plane coordinates which serves as an index for the digital orthophotos. The MA State Plane projection splits the State into Mainland and Island Zones, and the orthophoto images as produced are referenced to the correct Zone. Thus, two orthophoto grid templates exist for the Commonwealth. This represents a change from other MassGIS datalayers which are registered to the Mainland Zone only. The Island Zone contains Martha's Vineyard, Nantucket and the Elizabeth Islands. The Mainland Zone cover is stored as **OQMAIN** and the Island Zone is stored as **OQISLE**. The naming convention for each grid cell is based on the NAD83 meters coordinate pair for the lower right corner of the cell. The Grid ID is composed of the first 3 digits of each coordinate in this xy pair. For example, a grid cell with xy coordinates of 253000m 942000m at the lower right corner would have an ID of 253942. All datalayers registered to these index covers will have the grid number ID as part of their name.

OQMAIN and **OQISLE** are stored as single statewide coverages in the STATE library.

PRODUCTION

The index grids were generated by the Arc/INFO GENERATE command. The PROJECT command was used to orient the grids to the MA State Plane meters coordinate system and the two zones. Each grid cell is 4000 meters by 4000 meters.

ATTRIBUTES

The OQx.PAT contains the following items:

Item	Width	Output	Type	Description
SHEET_ID	4	6	B	Unique identifier of the grid cell. Concatenated string based on the first 3 digits of the lower right corner XY coordinate pair.
PROJECT	3	3	C	Name of project under which orthos have been or will be flown
DATEPHOTO	8	8	I	Date photography was taken.
DATEDIGITAL	8	8	I	Date digital product was received by MassGIS.
DATECONTOURS	8	8	I	Date that 3 meter contours were or will be produced
DATECONTROL	8	8	I	Date that control was completed
DATEPOINTS	8	8	I	Date that orthophoto point elevations were added to the library
DATEROADS	8	8	I	Date that orthophoto road centerlines were added to the library
DATEWET	8	8	I	Date OQ wetlands were added to the library
DATESTRM	8	8	I	Date OQ streams were added to the library
USGSPHOTO	8	8	I	Date of photography of USGS produced orthophotos
PROJ_AREA	15	15	C	Intermap's project area as indicated on their product CD label
CD-ID	2	2	C	Intermap's CD-ID number as indicated on their product CD label
CD_COPIES	1	1	I	Number of copies of CD MassGIS has received from Intermap
COMMENT	20	20	C	Comment field
YEARPHOTO	4	4	I	Year of photography
CD_CODE	17	17	C	Concatenation of PROJ_AREA and CD-ID

The OQx.TIC contains tics for each intersection of the arcs. The item that identifies these tics is:

Item	Width	Output	Type	Description
IDTIC	4	6	B	Concatenated string based on the first 3 digits of the lower right corner XY coordinate pair

MAINTENANCE

These datalayers are maintained by MassGIS. The "Date" items in the .PAT are updated as new OQ-tiled data (e.g. 1:5,000 Wetlands and Streams, Contours) are entered into the OQ and OQE libraries.

Color Coastal Orthophotos Index Datalayer
June 2001

OVERVIEW

This datalayer represents the indexing scheme for the 1:10,000 Coastal Color Orthophotos. The polygons in this index coverage were extracted from the statewide orthophoto index coverage (OQMAIN) for which color orthophotos are available, for both the mainland and island regions. Mass. Coastal Zone Management developed the layer, named **COQMAIN** and stored in the STATE library. The six-digit orthophoto ID is stored in the character field TILE-NAME and in the integer field SHEET-ID.

MAINTENANCE

MassGIS maintains this datalayer.

Coastal Zone Tiling Index Datalayer
April 1997

OVERVIEW

The Massachusetts Coastal Zone Management (MCZM) Program has developed an index to identify the geographic bounds, name and identification number for a series of MCZM published maps. Each tile measures 8,000 by 10,000 meters. The tile orientation is in both landscape and portrait. This tile scheme allows for plotting at a scale up to 1:10,000 in a single panel on a HP 755 device. The data are stored as a single statewide coverage named **CZMSHEET** in the **STATE** library.

METHODOLOGY

A polygon coverage was developed from keyboard entered coordinates. The geographic bounds of each tile are located on an increment of 2,000 meters.

ATTRIBUTES

The data layer has a .PAT with the following items:

Item Name	Width	Output	Type	Comments
NUMBER	4	4	C	Unique alpha-numeric code such as C-25
NAME	24	24	C	Place name identifier for the individual sheet
LAYOUT	1	1	C	L for Landscape
				P for Portrait

MAINTENANCE

MCZM maintains this datalayer.

Massachusetts DEP Regions Datalayer
July 1998

OVERVIEW

The DEP Regions layer represents boundaries used by the Massachusetts Department of Environmental Protection for planning and administrative purposes. The statewide coverage and layer are both named **REG_DEP**.

ATTRIBUTES

The **REG_DEP.PAT** (polygon attribute table) contains the following items:

REGION	DEP Administrative Region
DEP-ID	DEP Region Identifier

Codes are as follows:

REGION	DEP-ID	Description
WEST	1	Western region - Springfield headquarters
CEN	2	Central region - Worcester headquarters
NE	3	Northeast region - Woburn headquarters
SE	4	Southeast region - Lakeville headquarters

MAINTENANCE

MassGIS maintains this datalayer.

Massachusetts DEM Regions Regions Datalayer
July 1998

OVERVIEW

The DEP Regions layer represents boundaries used by the Massachusetts Department of Environmental Management for planning and administrative purposes. The statewide coverage/layer was derived from the Towns layer by DEM staff. It is named **REG_DEM**.

ATTRIBUTES

The **REG_DEM.PAT** (polygon attribute table) contains the following items:

REGION	Abbreviated name of regions
ALTREG	Region number

Codes are as follows:

ALTREG	REGION
1	Southeast
2	Northeast
3	Central
4	Connecticut
5	Berkshire

MAINTENANCE

MassGIS maintains this datalayer.

Regional Planning Agencies Datalayer
July 1998

OVERVIEW

This datalayer represents the boundaries of the 13 regional planning agencies (RPAs) in Massachusetts. Each RPA serves as a forum for state and local officials to address issues of regional importance, including the development of comprehensive plans and recommendations in areas of population and employment, transportation, economic development, regional growth and the environment. The layer was created in ARC/INFO based on the Towns layer and lists from each RPA and their member communities. The layer is named **RPAS** and is stored in the STATE library.

ATTRIBUTES

The **RPAS.PAT** (polygon attribute table) contains the item RPA, which represents the ID number of the regional planning agency. The key is as follows:

1 - BERKSHIRE COUNTY REGIONAL PLANNING COMMISSION
2 - FRANKLIN COUNTY PLANNING DEPARTMENT
3 - PIONEER VALLEY PLANNING COMMISSION
4 - MONTACHUSETT REGIONAL PLANNING COMMISSION
5 - CENTRAL MASSACHUSETTS REGIONAL PLANNING COMMISSION
6 - NORTHERN MIDDLESEX COUNCIL OF GOVERNMENTS
7 - MERRIMACK VALLEY PLANNING COMMISSION
8 - METROPOLITAN AREA PLANNING COUNCIL
9 - OLD COLONY PLANNING COUNCIL
10 - SOUTHEAST REGIONAL PLANNING & ECONOMIC DEVELOPMENT DISTRICT
11 - CAPE COD COMMISSION
12 - MARTHA'S VINEYARD COMMISSION
13 - NANTUCKET PLANNING & ECONOMIC DEVELOPMENT COMMISSION
14 - BELONGS BOTH TO MAPC & OCPC

MAINTENANCE

MassGIS maintains this datalayer. For contact information on the RPAs please see the page "Contacts/Where to Turn for More Information."

Massachusetts Highway Department Roads Datalayer
March 2000

OVERVIEW

This datalayer represents linework from the USGS 1:100,000 Roads Digital Line Graphs (DLGs) with additional linework from the Massachusetts Highway Department (MHD). Many of the new roads were provided to MHD by municipalities on various town-scale maps. Also, MHD made edits to existing DLG features. In addition, this layer includes extensive attribute information maintained by the MHD that has been linked to all features.

Eventually the linework in this datalayer will be replaced with 1:5,000 road centerlines that are being interpreted as part of the Digital Orthophoto development project. The MHD inventory and street attribute data will then be attached to the larger-scale mapping.

The **MHDROADS** layer is stored in the **QUAD** library. Coverages are tiled by 7.5-minute USGS Quad sheets and are named **MRD**. A subset of this layer comprising major roads has been created for smaller-scale mapping. See the MHD Major Roads datalayer description.

PRODUCTION

MassGIS received the Yearend 1999 MHD Road Inventory Data from the Bureau of Transportation Planning and Development and further processed the data to facilitate display, particularly in the MassGIS Data Viewer. Processing included: building routes for the items CSN, STREET_NAME, ROUTE, and ADMIN_TYPE; and building five subclasses of annotation (MAJOR2, MAJOR, LARGE, MEDIUM, and SMALL) which may be used for displaying street names depending on scale (in Arcplot use textset font prior to issuing the annotext command). In the data delivered to MassGIS, MHD includes items developed for this layer by the Department of Environmental Protection's GIS Group, including a classification scheme for plotting roads based on functional class and access control and adding the item CLASS to the arc attribute table (.aat) (see details below); adding the items STREET_NAME and RT-NUMBER to the .aat; and straightening the linework with the Arcedit STRAIGHTEN command, which eliminates most dimpled arc intersections.

ATTRIBUTES

Please refer to the digital metadata files for a complete listing of item descriptions and attributes.

The **MRD.AAT** (Arc Attribute Table) contains the following items:

COUNTY-CODE	County Code		
	A = Barnstable	H =	Hampshire
	B = Berkshire	I =	Middlesex
	C = Bristol	J =	Nantucket
	D = Dukes	K =	Norfolk
	E = Essex	L =	Plymouth
	F = Franklin	M =	Suffolk
	G = Hampden	N =	Worcester

SERIAL_NUMBER	Used to uniquely identify a roadway segment within a given county

CLASS	Used to designate a road based on functional classification and access; used for plotting

Classes are:

1 - Limited Access Highway	5 - Minor street or road
2 - Multi-lane Highway, not limited access	6 - Minor street or road (No assigned CSN)
3 - Other numbered route	7 - Track (from USGS DLGs)
4 - Major road - collector	8 - Trail (from USGS DLGs)

ADMIN_TYPE   Based on AUTO-RT-SIGN from MRD.INV file

Types are:

1 - Interstate   2 - U.S. Federal   3 - State   0 - Local road

Roads with more than one sign type are preferenced in the above order.

RT-NUMBER   Route number of the road type listed in ADMIN_TYPE

STREET_NAME   Street name from the MRD.STREETS file (see details of this INFO table below)

** REDEFINED ITEMS **

CSN   County Code + Serial Number   Used to uniquely identify any roadway segment within the entire state

Note: This item is the link to the road inventory file (mrd.inv)

RELATED DATABASE FILES

The items for descriptions of street listings in the related file **MRD.STREETS** ("Streets File") are:

CITY_NUM	City or Town Number Abington = 1 ... Yarmouth = 351
RIN	Road Inventory Number. Used to uniquely identify any road within a given town
STREET_NAME	Street Name with Suffix
FRM-ST-NUM	From RIN
FRM-ST-NAME	From RIN name. Refers to either a road, a town or state line, a dead end, private property, or a cul-de-sac.
TO-ST-NUM	To RIN
TO-ST-NAME	To RIN name. See Item FRM-ST-NAME for description
CITY_RIN_H	City or Town Number + Road Inventory Number (RIN). Used to uniquely identify any road within the entire state.
	Note: This item is the link to the road inventory file (MRD.INV)
** Redefined Items **	
CITY_RIN	CITY_NUM + RIN
OUTPUT	All fields

The **MRD.INV** ("Inventory File") file stores information on the road inventory. The items are:

1   **CITY_NUM**: City or Town Number Abington = 1 ... Yarmouth = 351

2   **RIN**: Road Inventory Number. Uniquely identifies each road within a given town

3   **FRM-ST-NUM**: From Road Inventory Number (RIN)

xxxx	=	RIN
Xxxx	=	Bordering town line, where X=1st letter of bordering town name and xxx=CITY_NUM
0000	=	Dead end
00CT	=	CT state line
00NH	=	NH state line
00NY	=	NY state line
00RI	=	RI state line
00VT	=	VT state line
8888	=	Private property
9999	=	Cul-de-sac

Note: From and To Road Inventory Number are for the entire road (RIN), not for the road segment (SERIAL_NUMBER).

4   **TO-ST-NUM**: To Road Inventory Number (RIN)
See Item # 3 (FRM-ST-NUM) for description

5   **ADMIN_SYS**: Administrative System

1	=	Massachusetts Highway Department
2	=	City or town accepted road
3	=	Metropolitan District Commission
4	=	Massachusetts Turnpike Authority
5	=	Massachusetts Port Authority
6	=	State Park or Forest
7	=	State institutional
8	=	Federal Park or Forest
9	=	County Institutional
0	=	Unaccepted by city or town
B	=	State college or university
C	=	US Department of Defense
D	=	US Army Corps of Engineers
E	=	Federal Institutional
F	=	Other Federal
G	=	Federal Bureau of Indian Affairs
H	=	Miscellaneous Bridges

6   **FEDAID_SYS**: National Highway System (NHS) Status

0	=	Not on NHS
1	=	NHS - Interstate
2	=	NHS - Strategic Defense Highway System (STRAHNET)
3	=	NHS - STRAHNET Connector
4	=	NHS - Other
5	=	NHS - Other - One-way pair
6	=	NHS - Other truck route exclusion
7	=	NHS connection to major intermodal terminal (proposed)

7   **FEDAID-RT-NUM**: Federal-Aid Route Number

8   **FEDAID-UR-DESIG**: Federal-Aid Urban/Rural Designation

1	=	Urban city
2	=	Urban town
5	=	Rural town

Note: A town may be partially urban and partially rural.

9   **FUNC-CLASS**: Functional Classification

0	=	Local
1	=	Interstate
2	=	Rural principal arterial and Urban extensions
3	=	Rural minor arterial and Urban extensions
4	=	Other Urban principal arterial
5	=	Urban minor arterial or Rural major collector
6	=	Urban collector or Rural minor collector

Note: Use urban/rural designation to interpret functional classification.

10   **AUTO-RT-NUMBER**: Auto Route Number
        Interstate, US Highway, or State Numbered Highway route number
        Note: If multiple routes exist on a section, the lowest number on the highest system is recorded (Interstate>US>State);
        Other routes under hierarchy are listed in Item # 11 (ALT-RT-NUMBER).

11   **ALT-RT-NUMBER**: Alternate Route Number(s)
        All other routes under hierarchy of Item # 10
        Note: Field begins and ends with a "+", and routes are separated by "+"s.

12   **D-SH-WID**: Left Side Right Shoulder Width for DIVIDED Roadway Only, in feet.

13   **D-SH-TYP**: Left Side Right Shoulder Type for DIVIDED Roadway Only
        S   =   Stable - Unruttable compacted subgrade
        U   =   Unstable shoulder
        H   =   Hardened bituminous mix or penetration
        Note: Null = no left side right shoulder OR not a divided roadway OR no data.

14   **DIV-L-SU-WID**: Left Side Surface Width of Travel Lanes for DIVIDED Roadway Only
        0   =   Not a divided roadway OR no data.
        Note: Width of traveled way in feet, excluding shoulders/auxiliary lanes.

15   **MED-WID**: Median Width for DIVIDED Roadway Only
        0   =   Not a divided roadway OR No data
        Note: Width in feet; coded as 99, if over 100 feet.

16   **DIV-L-NUM-TR-LA**: Left Side Number of Travel Lanes for DIVIDED Roadway Only
        0   =   Not a divided roadway OR No data

17   **CURBS**: Curbs
        0   =   None
        1   =   Left side only
        2   =   Right side only
        3   =   Both sides
        4   =   Along median only
        5   =   All curbs (divided highway)
        Note: For urban sections only.

18   **L-SW-WID**: Left Sidewalk Width
        0   =   No left sidewalk OR No data
        Note: For urban sections only; Width in feet.

19   **R-SW-WID**: Right Sidewalk Width
        0   =   No right sidewalk OR No data
        Note: For urban sections only; Width in feet.

20   **STREET-OPERATION**: Street Operation
        0   =   No data
        1   =   One-way traffic
        2   =   Two-way traffic

21   **L-SH-WID**: Median Shoulders Width for DIVIDED Roadway OR Left Shoulder Width for UNDIVIDED Roadway
        Note: Width in feet; for DIVIDED roadways, median shoulders are assumed to have the same width.

22   **L-SH-TYPE**: Median Shoulders Type for DIVIDED Roadway OR Left Shoulder Type for UNDIVIDED Roadway
        See item # 14 (D-SH-TYP) for description
        Note: For DIVIDED roadways, median shoulders are assumed to have the same type.

23   **SUR-WID**:   Right Side Surface Width for DIVIDED Roadway OR Surface Width for Entire UNDIVIDED Roadway
        0   =   No data
        Note: Coded as 99, if over 100 feet; Measurement of travelled way, excluding shoulders/auxiliary lanes.

24   **SUR-TYP**: Surface Type of Either DIVIDED or UNDIVIDED Roadway
        0   =   No data
        1   =   Unimproved, graded earth, or soil surface road
        2   =   Gravel or stone road
        3   =   Brick road
        4   =   Block road
        5   =   Surface-treated road
        6   =   Bituminous concrete road
        7   =   Portland cement concrete road
        8   =   Composite road; flexible over rigid
        9   =   Composite road; rigid over flexible or rigid over rigid ('white topping')
        Note: For both DIVIDED and UNDIVIDED roadways.

25   **R-SH-WID**:   Right Side Right Shoulder Width for DIVIDED Roadway OR Right Shoulder Width for UNDIVIDED Roadway
        Note: Width in feet.

26   **R-SH-TYP**:   Right Side Right Shoulder Type for DIVIDED Roadway OR Right Shoulder Type for UNDIVIDED Roadway
        See Item # 14 (D-SH-TYP) for description

27   **UNDIV-RRWY-#TRLA**:   Right Side Number of Travel Lanes for DIVIDED Roadway OR Total Number of Travel Lanes fo UNDIVIDED
        Roadway
        0   =   No data

28   **ACC_CON**: Access Control
        0   =   No control
        1   =   Full control
        2   =   Partial control

29   **TERRAIN**: Terrain
        0   =   No data
        1   =   Level

2	=	Rolling	
3	=	Mountainous	

30   **ROW-WID**: Right of Way Width
0   =   No data
Note: Width in feet.

31   **SPEED_LIMIT**: Speed Limit
0   =   No data
Note: Speed limit in miles per hour.

32   **ODOM-READ**: Cumulative Odometer Reading
Note: In hundredths of a mile (xx.xx); This value does not represent section length.

33   **URB-AREA**: Urbanized Area

URBANIZED AREAS

A =	Boston	H =	Pittsfield
B =	Brockton	I =	Providence-Pawtucket
C =	Fall River	J =	Springfield
D =	Fitchburg-Leominster	K =	Worcester
E =	Lawrence-Haverhill	L =	Taunton
F =	Lowell	M =	Hyannis
G =	New Bedford		

SMALL URBAN AREAS

1 =	Athol	R =	Plymouth
5 =	Spencer	S =	Greenfield
6 =	Ware	U =	Southbridge
O =	North Adams	V =	Clinton-Lancaster
Q =	Gardner-Templeton		

Note: If NULL, roadway section is in RURAL area.

34   **HPMS-CODE**: HPMS (Highway Performance Monitoring System) Code
0   =   Not an HPMS section nor on a road that has an HPMS section
1   =   Not an HPMS section but is on a road that has an HPMS section
2   =   An HPMS section - special "sample" sections that require additional data (# of railroad crossings, percentage of truck

traffic, etc.)

35   **AUTO-RT-SIGN**: Auto Route Signing
0   =   Roadway is not signed as a numbered auto route
1   =   Roadway is signed as an Interstate route
2   =   Roadway is signed as a US Highway route
3   =   Roadway is signed as a State route
Note: System hierarchy in Item # 10 (AUTO-RT-NUMBER) is used.

36   **SPECIAL_FUN**: Special Systems
0   =   Not an addition to the Interstate system
1   =   Addition to Interstate system (23 U.S.C. 139(c))
2   =   Addition to Interstate system (23 U.S.C. 139(a))-approved before March 9, 1984
3   =   Addition to Interstate system (23 U.S.C. 139(a))-approved on or after March 9, 1984
Note: Used to identify Special Highway System Categories.

37   **MEDIAN_TYPE**: Median Type for DIVIDED Roadway Only
0   =   None
1   =   Curbed
2   =   Positive barrier
3   =   Unprotected

38   **TYPE_URB_LOC**: Urban Location
0   =   Not applicable (i.e., not a principal arterial nor in an urbanized area)
1   =   Central Business District (CBD)
2   =   High density business/commercial center (excluding CBD)
3   =   Low density commercial
4   =   High density residential (5,000 or more persons per square mile)
5   =   Low density residential (less than 5,000 persons per square mile)
6   =   Other urban area, including undeveloped land

39   **TOLL_RD**: Toll
1   =   Not a toll road
2   =   A toll road

40   **COUNTY-CODE**: County Code

A	=	Barnstable	H	=	Hampshire
B	=	Berkshire	I	=	Middlesex
C	=	Bristol	J	=	Nantucket
D	=	Dukes	K	=	Norfolk
E	=	Essex	L	=	Plymouth
F	=	Franklin	M	=	Suffolk
G	=	Hampden	N	=	Worcester

41   **SERIAL_NUMBER**: Serial Number
Uniquely identifies each roadway segment within a given county

42   **CSN_H**: County Code + Serial Number (with blanks)
Uniquely identifies each roadway segment within the entire state
Note: This item is the link to the town-level coverages (MRD's).

43   **CSN_ZF**: County Code + Serial Number (zero filled)
Uniquely identifies each roadway segment within the entire state

> *Note: This item is the link to the town-level coverages (MRD's)..*

44   **CITY_RIN_H**: City or Town Number + Road Inventory Number (zero filled)
            Uniquely identifies each road within the entire state
            Note: This item is the link to the street listing file (MRD.STREETS).

45   **MILES**: Length of street segment in miles.

46   **STREET_NAME**: Street name, from the MRD.STREETS file.

** REDEFINED ITEMS **
CSN: County Code + Serial Number (with blanks).
CITY_RIN: CITY_NUM + RIN
D-SH-WT: D-SH-WID + D-WID-TYP
L-SH-WT: L-SH-WID + L-WID-TYP
R-SH-WT: R-SH-WID + R-WID-TYP
OUTPUT: All fields

MAINTENANCE

MassGIS and MHD are maintaining this layer.

MHD Major Roads, Routemarker Locations, and Highway Exits Datalayers
March 2000

OVERVIEW

This datalayer represents the "major roads" in the Commonwealth from the Massachusetts Highway Department (MHD) Roads datalayer. Four classes of road are included: Limited Access Highways (such as Interstates with on- and off-ramps as the only means of access), Multi-lane Highways without limited access, Other Numbered Highways (such as state and Federal routes that are not included in the previous two categories), and Major Road-Connectors (non-numbered routes that connect numbered routes). These major roads are stored as one statewide coverage; the coverage name is **MAJRDMHD** and the STATE library layer name is **MAJ_RD_MHD**.

Another statewide layer, **MHDRDPTS**, is a point coverage that may be used for plotting route shields that have the look of the actual highway signs (i.e. red, white and blue Interstate; U.S. shields; boxes for State routes).

A third related statewide layer, **EXITS**, is a point coverage that includes the location and ID number of major highway interchanges.

ATTRIBUTES

Please refer to the digital metadata files for a complete listing of item descriptions and attributes. The **MAJRDMHD.AAT** contains the following items:

CLASS	Used to designate a road based on functional classification and access; used for plotting Classes are: 1 - Limited Access Highway 2 - Multi-lane Highway, not limited access 3 - Other numbered route 4 - Major road - collector
ADMIN_TYPE	Based on AUTO-RT-SIGN from MRD.INV road inventory file Types are: 1 - Interstate 2 - U.S. Federal 3 - State 4 - Major Road-Connector Roads with more than one sign type are preferenced in the above order.
RT-NUMBER	Principal route number of the road type listed in ADMIN_TYPE
ALT-RT-NUMBER	Route number of the road type listed in ALT-ADMIN_TYPE
ALT-ADMIN_TYPE	Alternate ADMIN_TYPE by ADMIN_TYPE hierarchy listed above

The **MHDRDPTS.PAT** contains the following items:

RT-NUMBER	4	4	C	-	RTNO	Route Number
ALT-RT-NUMBER	4	4	C	-		Alternate Route Number
RT-ID	4	4	I	-		Markerset symbol number for RT-NUMBER
ART-ID	4	4	I	-		Markerset symbol number for ALT-RT-NUMBER
MARKER	3	3	I	-		Code for scale dependency when plotting markers
FUNC-CLASS	1	1	I	-		Functional class for road of RT-NUMBER, from MHD

The **EXITS.PAT** contains the following items:

INTMARK-ID	4	5	B	-	Markersymbol number in custom markerset used for plotting
ROUTE	4	4	C	-	Route Number of major highway on which the exit is located

DATA DISPLAY

To plot the MHDRDPTS routemarker locations layer using Arcplot, use the markerset solidshld.mrk; a special font fnt029 must be located either locally or in the $archome/igl63exe directory. Issue the pointmarkers command and use the RT-ID (route number) or ART-ID (alternate route number) item, which matches the appropriate symbol in the solidshld.mrk markerset. The font and markerset files may be downloaded from the MassGIS Web site at http://www.state.ma.us/mgis/majrdmhd.htm.

To plot these points in ArcView with appropriate route shield markers, do the following:

1. Download a set of route shields created for Massachusetts from the ESRI Scripts page at http://gis.esri.com/arcscripts/details.cfm?CFGRIDKEY=-189183665. Jim Mossman of Data Deja View developed this ArcView palette file.
2. Follow the instructions included in the .zip file for installation of the fonts onto a Windows PC.
3. Download mhdrtid.avl from http://www.state.ma.us/mgis/mhdrtid.avl and use this MassGIS-produced ArcView legend file for symbolization.
4. Add the Route Location theme in ArcView and load the mhdrtid.avl legend, symbolizing on the RT-ID item.
5. You may want to adjust the size of the markers or select a subset based on the MARKER field to avoid too many shields plotting, depending on your map scale.

Please note that the locations of these points have been chosen to optimize display and do not represent actual roadside locations of route signs.

MAINTENANCE

MassGIS and MHD are maintaining this layer.

Trains Datalayer
June 1998

OVERVIEW

The Central Transportation Planning Staff updated and enhanced railroad linework distributed by the United States Geological Survey (USGS) as 1:100,000 Digital Line Graphs (DLGs). CTPS added several attributes pertaining to type of service, MBTA Commuter Rail status and stations, rail line ownership, and freight and passenger operation. MassGIS distributes these data as a single statewide coverage called **TRAINS**.

The linework is generally excellent, although some railroads are discontinuous (not perfectly edgematched) at USGS 1:100,000 quadrangle boundaries. Other tranportation linework that appears on the USGS 1:100,000-scale maps, such as pipelines and transmission lines, are included in the **TRNSLNS** coverage; please see the Transmission Lines datalayer description for more details.

PRODUCTION

In addition to the new attribute coding mentioned above (see details of tables below), some linework obtained from a variety of sources (see below) was added to the DLGs by CTPS staff. CTPS also created routes and sections from the arcs for the Commuter Rail lines. MassGIS performed quality checking on the data, which included minimal updating of Commuter Rail station names. Using the Arcplot commands ANNOCOVERAGE and NODETEXT, MassGIS created three subclasses of annotation from the STATION item in the node attribute table: ANNO.COMM for large scale maps, and ANNO.LARGE and ANNO.LARGE2 for regional scale maps. In each subclass, Level 1 is for active stations, Level 2 for proposed stations.

ATTRIBUTES

The **TRAINS** arc attribute table (.AAT) includes the following items:

TYPE	2	2	I	-		see Table 1 below
SOURCE	5	5	C	-		see Table 2 below
COMMRAIL	1	1	C	-		see Table 3 below
OWNERSHIP	10	10	C	-		see Table 4 below
FREIGHT_OP	10	10	C	-		see Table 5 below
PASS_OP	11	11	C	-		see Table 6 below
COMM_LINE	40	40	C	-		see Table 7 below
LINE_BRNCH	20	20	C	-	LINE_BRANCH	see Table 8 below
VALPLANNUM	6	6	N	2	VAL_PLAN_NUM	
VALPLANOWN	10	10	C	-	VAL_PLAN_OWN	see Table 9 below

Concatenated code attributes from the original DLG file MAJOR/MINOR pairs, which had been included in an earlier version of this coverage in the item MINOR_NUM, have been dropped from the .AAT.

The **TRAINS** node attribute table (.NAT) includes the following items:

STATION	25	25	C		STATION_NAME	MBTA Commuter Rail Station name
LOT_NUMBER	3	3	I	-		Code not currently used; not reliable
C_RAILSTAT	1	1	C	-	COMMRAIL_STATUS	see Table 3 below
BIKE_TRAIL	40	40	C	-		only Minuteman

The **TRAINS** Route Attribute Table (.RATTRAIN) includes the following items:

TRAIN-ID	4	5	B	-		see Table 10 below
ARCLENGTH	4	12	F	3		
MEASURELEN	4	12	F	3	MEASURELENGTH	
NUMSECTION	4	5	B	-	NUMSECTIONS	
LINE_BRNCH	50	50	C		LINE_BRANCH	

The **TRAINS** Section Table (.SECTRAIN) includes the following items:

```
ROUTELINK#         4   5   B   -
ARCLINK#           4   5   B   -
F-MEAS             4  12   F   3
T-MEAS             4  12   F   3
F-POS              4  12   F   3
T-POS              4  12   F   3
TRAIN#             4   5   B   -
TRAIN-ID           4   5   B   -
RATIO              4  12   F   3
```

The following tables detail code descriptions of items.

Table 1 - TYPE (.AAT) Type of service

1	Active
2	Multi use, Active rail and recreation
3	Abandoned Rail Line
4	Abandoned Rail Line in Right of Way in Public Ownership
5	Activity status is unknown
6	Out of Service
7	Recreation, hiking or biking
8	Out of state, to Bradley, Green and Manchester airports.

Table 2 - SOURCE (.AAT) Source of linework

DLG	Original USGS 1:100000 Digital Line Graphs
CTPS	Line work or data items altered by CTPS staff
1890	1890 Topographical maps of Massachusetts (MA publisher)
1938	1938 General Highway Maps (MA DPW publisher)
VPmap	Valuation Section Maps of 1917 of NY,NH&H,and,Central NE Lines and circa. 1970's Boston and Maine Valuation Section Map

Table 3 - COMMRAIL (.AAT) or C_RAILSTAT (.NAT)   MBTA Commuter Rail status

Y	Active MBTA commuter line
P	proposed extensions

Table 4 - OWNERSHIP (.AAT) Ownership of line

AMTRAK	AMTRAK
B&M	Boston and Maine
CONRAIL	Consolidated Railroad Corporation
CT	out of state, Connecticut
DEM	MA Department of Environmental Management
EOTC	MA Executive Office of Transportation and Construction
FEDERAL	United States Gov't--DOD and Parks
G&U	Grafton and Upton Railroad
HOUSATONIC	Housatonic Railroad
LOCAL	City or Town
MBTA	Massachusetts Bay Transportation Authority
MDC	Metropolitan District Commission
MTA	Massachusett Turnpike Authority
MWRA	Massachusetts Water Resources Authority
NECR	Northeast Corridor Railroad- AMTRAK
NH	out of state, New Hamphire
P&W	Providence and Worcester Railroad
PI	Private Industry
PRIVATE	Private Owner
PV	Pioneer Valley
RI	out of state, Rhode Island
UTILITY	Utility

Table 5 - FREIGHT_OP (.AAT) Freight Operation

BC	Bay Colony Railroad
CONRAIL	Consolidated Railroad Corporation
CV	Central Vermont Railway
G&U	Grafton and Upton Railroad
HOUSATONIC	Housatonic Railroad
MCR	Massachusetts Central Rail Railroad
P&W	Providence and Worcester Railroad
PV	Pioneer Valley Railroad
QB	Quincy Bay Terminal Company
STRC	Springfield Terminal Railway Company

Table 6 - PASS_OP (.AAT) Passenger Operation

AMTRAK	AMTRAK
AMTRAK	AMTRAK summer line to Cape
AMTRAK/MBTA	AMTRAK and MTBA share service
MBTA	Massachusetts Bay Transportation Authority

Table 7 - COMM_LINE (.AAT) MBTA Commuter Rail line

att-sto	Attleboro/Stoughton Line
fair	Fairmont Line
fitch	Fitchburg/South Acton Line
fram-wor	Framingham/Worcester Line
frank	Franklin Line
hav	Haverhill/Reading Line
low	Lowell Line
ips-roc	Rockport/Ipswich Line
nee	Needham Line

Where more than one line uses same track, separated by commas

Table 8 - LINE_BRNCH (.AAT) Main line or Branch

B&A_WORCESTER
DORCHESTER BRANCH
EASTERN ROUTE
ESSEX BRANCH
FITCHBURG
FRANKLIN
GEORGETOWN BRANCH
GLOUCESTER
KINGSTON BRANCH
MERRIMAC BRANCH
MIDDLEBOROUGH MAIN
MIDDLEBORUOGH LINE
NEEDHAM BRANCH
NEW HAMPSHIRE
NEWBURYPORT BRANCH
PLYMOUTH BRANCH
SALEM & LAWRENCE
SALISBURY BRANCH
SHORE LINE
STOUGHTON BRANCH
WESTERN ROUTE
WILDCAT
WOBURN BRANCH
CHARLES RIVER (FREIGHT)

Table 9 - VALPLANOWN (.AAT) Owner at the time of 1917 Valuation

B&A   Boston and Albany Railroad
B&M   Boston and Maine Railroad
B&P   Boston and Providence Railroad
CHATHAM RA   Chatham Railroad
CV   Central Vermont Railroad
G&U   Grafton and Upton Railroad
MANCHESTER   Manchester Railroad
N&W   Norwich and Worcester Railroad
NYNH&H   New York, New Haven and Hartford Railroad
OLD COLONY   Old Colony Railroad
P&W   Providence and Worcester Railroad
SALEM & LA   Salem and Lawrence Railroad

Table 10 - TRAIN-ID (.RATTRAIN) Dynamic Segmentation Route Attribute Table

Train-id
1   SHORE LINE
2   NEW HAMPSHIRE
3   FITCHBURG
4   EASTERN ROUTE
5   WESTERN ROUTE
6   GLOUCESTER BRANCH
7   WILDCAT BRANCH
8   DORCHESTER BRANCH
9   NEEDHAM BRANCH
10   B&A WORCESTER
11   MIDDLEBOROUGH MAIN LINE
12   PLYMOUTH BRANCH
13   KINGSTON BRANCH
14   STOUGHTON BRANCH
15   FRANKLIN BRANCH
16   CHARLESRIVER BRANCH
17   BRAINTREE SECONDARY
18   BUZZARDS BAY SECONDARY
19   WEST HANOVER SECONDARY
20   NANTASKET SECONDARY

MAINTENANCE
The Central Transportation Planning Staff will update the datalayer as needed.

MBTA Rapid Transit Datalayer
June 1998

OVERVIEW

This datalayer comprises the four subway and streetcar lines in the Massachusetts Bay Transportation Authority's rapid transit rail network. The four 'T' lines - Blue, Green, Orange, and Red - are represented with linework. Station names are included in nodetext and annotation. The coverage was developed by the Central Transportation Planning Staff (CTPS) and is stored as a single statewide layer called **MBTA**.

PRODUCTION

Original linework was acquired from 1:100,000 USGS Digital Line Graph transportation data, and updates and additions were made by CTPS staff. MassGIS performed further quality checking and updating of the station names. Annotation was created from the STATION item in the node attribute table with the Arcplot ANNOCOVERAGE and NODETEXT commands and textset FONT.TXT, and was sized and placed for optimum cartographic display.

ATTRIBUTES

Each **.AAT** (arc attribute table) has the following items:

SOURCE	5	5	C	-	-	Either DLG or CTPS
LINE	6	6	C	-	-	BLUE, GREEN, ORANGE, or RED
LINE_CO	3	3	I	-	-	Color symbol number

Each **.NAT** (node attribute table) has the following items:

STATION	25	25	C	-	-	Name of T Station
LOT_NUMBER	3	3	I	-	-	First phase of construction, currently incomplete
TYPE	10	10	C	-	-	Surface Green and Red Line trolleys where coded

MAINTENANCE

This datalayer will be updated as needed by the Central Transportation Planning Staff.

Transmission Lines Datalayer
December 1995

OVERVIEW

The U.S. Geological Survey (USGS) distributes Digital Line Graphs (DLG) from its 1:100,000-scale maps showing pipelines, transmission lines, and other miscellaneous transportation features. MassGIS assembled these data into the statewide coverage **TRNSLNS**, consisting of all the transportation features identified by USGS other than railroads and vehicle roadways and which appear on the 1:100,000 USGS quadrangle sheets.

Although the pipelines and transmission lines appear on maps, they are not necessarily in active use. The linework is generally excellent, although MassGIS has noted that some lines are discontinuous (not perfectly edgematched) at USGS 1:100,000 quadrangle boundaries. Railroad transporation features are included in the **TRAINS** coverage; please see its datalayer description for details.

ATTRIBUTES

The **TRNSLNS** arc attribute table (.AAT) includes the following concatenated code attributes from the original DLG file MAJOR/MINOR pairs:

MINOR_NUM	DESCRIPTION
201	PIPELINE
202	POWERLINE
204	SKI LIFT/TRAMWAY
401	SUBSTATION
403	LANDING STRIP/AIRPORT
201205	PIPELINE ARBITRARY EXTENSION
202205	POWERLINE ARBITRARY EXTENSION

More information about the 1:100,000 DLG files including the major/minor code descriptions can be found in the USGS National Mapping Division publication, *Digital Line Graphs from 1:100,000-Scale Maps*.

Long Distance Trails Datalayer
July 1999

OVERVIEW

The Long Distance Trails Datalayer is a line coverage representing trails that are longer than 25 miles. The data was created for the purpose of regional planning and mapping by the Massachusetts Department of Environmental Management and was modified for DEM by the University of Massachusetts in 1997. At scales of 1:50,000 or smaller the data is reliable for all trails; between 1:50,000 and 1:25,000 the data quality of some trails may be significantly inaccurate; for scales greater than 1:25,000 the quality of most trails will be significantly inaccurate. The dataset is stored as a single statewide layer named **LDTRAILS**.

PRODUCTION

All data was digitized from paper maps, most coming directly from USGS Topographic Quadrangles.

ATTRIBUTES

The .AAT (arc attribute table) contains the following item:

NAME1   The name of the long distance trail

MAINTENANCE

The Department of Environmental Management is maintaining this datalayer. The data may be used in conjunction with the *Rail Trails Datalayer,* also produced by DEM.

Rail Trails Datalayer
July 1999

OVERVIEW

The Rail Trails Datalayer is a line coverage representing abandoned railroad rights-of-way and public bike trails that use the rights-of-way. The dataset was created by the Massachusetts Department of Environmental Management for the purpose of regional planning and mapping. At scales of 1:50,000 or smaller the data is reliable for all trails; between 1:50,000 and 1:25,000 the data quality of some trails may be significantly inaccurate; and for scales greater than 1:25,000 the quality of most trails will be significantly inaccurate. This data set is stored as a single statewide layer named **RAILTRAILS** (coverage **RAILTR**).

PRODUCTION

The data was originally modified by DEM from the MassGIS Railroads Datalayer; it has since been modified for DEM by the University of Massachusetts in 1997. All modifications were made using information from various paper maps, and much of the data came directly from USGS Topographic Quadrangles.

ATTRIBUTES

The **.AAT** (arc attribute table) contains the following items:

Trails	A = Abandoned, E = Existing, C= Considered
Owner	Owner's name
Prev_owner	Previous owner's name
Linename	The name of the old line or existing trail
Manager	If different from owner
Status_Man	S = State M= Municipal
Status_Own	S= State M= Municipal

MAINTENANCE

The Department of Environmental Management is maintaining this datalayer. The data may be used in conjunction with the Long Distance Trails Datalayer, also produced by DEM.